

数学与系统科学研究院

计算数学所学术报告

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报告题目:

**Exponential Time Differencing  
Gauge Method for Incompressible  
Viscous Flows**

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报告地点: 数学院南楼七层

702 会议室

## **Abstract:**

To design efficient and accurate time integration schemes for numerically simulating incompressible viscous flows, such as those governed by Stokes or Navier-Stokes equations, the discretization and coupling of velocity and pressure need to be treated carefully for stability and consistency. The gauge formulation introduces a gauge variable and an auxiliary field for the fluids equations, and the resulting system contains a coupled momentum equation and a kinematic equation with certain consistent boundary conditions. In this talk, we discuss an exponential time differencing multistep method for solving the gauge system with high-order temporal accuracy. In particular, the momentum equation is completely decoupled from the kinematic equation in the discrete level at each time step and is solved by explicit exponential time stepping schemes. We analyze the stability of the proposed method and rigorously prove that the first order exponential time differencing scheme is unconditionally stable for the Stokes flows. We also present a compact representation of the method for problems on rectangular domains, which makes FFT-based fast solvers available for the resulting fully discrete problem. Various numerical experiments are carried out to demonstrate the accuracy and stability of the proposed method.

**欢迎大家参加！**